Claims

[c1] 1. A system for performing simultaneous reactions in a plurality of flow-through reaction tubes, comprising:

a temperature control system operative to maintain a predetermined temperature in each of the plurality of flow-through reaction tubes;

a gas delivery system operative to deliver at a predetermined rate a reaction gas having a uniform composition to each of the plurality of flow-through reaction tubes, wherein the reaction gas is operative to react with a predetermined catalyst disposed within each of the plurality of flow-through reaction tubes to form a reaction product; and

a collection device coupled to at least one of the plurality of flow-through reaction tubes for collecting the reaction product.

[c2] 2. The system of claim 1, wherein the predetermined temperature of each of the plurality of reaction tubes is substantially the same temperature.

[c3] 3. The system of claim 1, wherein the predetermined temperature of each of the plurality of reaction tubes is individually controlled.

[c4] 4. The system of claim 1, wherein the predetermined rate of delivery of reaction gas to each of the plurality of reaction tubes is substantially the same rate.

[c5] 5. The system of claim 1, wherein the predetermined rate of delivery of reaction gas to each of the plurality of reaction tubes is individually controlled.

[c6] 6. The system of claim 1, wherein the collection device is simultaneously coupled to each of the plurality of reaction tubes.

[c7] 7. The system of claim 1, wherein the collection device is coupled to a selected subset of the plurality of reaction tubes.

[c8] 8. The system of claim 1, further comprising an analytical device connected to the collection device, wherein the collection device is sequentially coupled to a selected one of the plurality of reaction tubes.

[c9] 9. The system of claim 1, wherein the simultaneous gas reactions comprise a

gas-condensed phase reaction.

[c10] 10. The system of claim 1, wherein the predetermined catalyst associated with each of the plurality of reaction tubes are individually varied to form a combinatorial experiment.

[c11] 11. The system of claim 1, wherein at least one of the gas delivery system, the temperature control system and the collection device further comprises a plurality of fittings corresponding to each of the plurality of reaction tubes, wherein each of the plurality of fittings is variably biased to operatively sealingly engage the corresponding reaction tube.

[c12] 12. A chemical reaction and analysis system, comprising:

a set of parallel, flow-through reactors, each reactor having an inlet port and an exit port, each reactor having supports for supporting a condensed phase catalyst or reagent bed disposed within the reactor, and each reactor capable of allowing gas-condensed phase reactions to occur within the reactor;

a reaction gas source fluidly coupled to the reactors;

at least one flow controller operatively connected to the reaction gas source and the reactors to independently regulate the rate of feed of a reactant gas from the reaction gas source to the reactors;

a temperature control system operatively connected to the reactors for controlling a temperature of the reactors; and

a collection device in communication with the exit ends of the reactors for collecting effluent vapor products of the gas-condensed phase reactions and unused reactant gas from the reactors.

[c13] 13. The system of claim 12, further comprising an analytical system in communication with the collection device for analyzing the effluent vapor products of the gas-condensed phase reactions in real-time.

[c14]

14. The system of claim 12, wherein the reactors are made of any suitable material to provide an inert environment for the gas-condensed phase reactions

that occur within the reactors.

[c15] 15. The system of claim 12, wherein the temperature control system is a thermal block that substantially surrounds the reactors so that the reactors are substantially in thermal communication with the thermal block.

[c16] 16. A reaction device for use in gas-condensed phase reaction and analysis systems, comprising:

a reactor tube having an inlet end and an exit end;

at least one bed disposed within the reactor tube; and

a preheating material disposed within the reactor tube for pre-heating a reactant gas before the reactant gas contacts the bed, the preheating material being disposed adjacent to the bed and closer to the inlet end than the bed.

[c17] 17. The reactor tube of claim 16, wherein the bed is a catalyst bed or a reagent bed.

[c18] 18. The reactor tube of claim 16, wherein the preheating material comprises an inert, low surface area structure that allows a gas flow.

[c19] 19. The reactor tube of claim 16, further comprising an auxiliary inlet disposed near the inlet end.

[c20] 20. The reactor tube of claim 19, wherein the auxiliary inlet allows a reactant gas to be introduced into the reactor tube, and the inlet end is capable of allowing a temperature measuring device to be inserted into the reactor tube for monitoring a temperature within the reactor tube while simultaneously preventing the escape of reaction products and unused reactant gas from the reactor tube.

[c21] 21. The reactor tube of claim 19, wherein the combination of the auxiliary inlet and the inlet end allows both the reactant gas and a gaseous co-reagent to be introduced into the reactor tube simultaneously.

[c22] 22. A method for performing simultaneous reactions in a plurality of flow-

through reaction tubes, comprising:

maintaining a predetermined temperature in each of the plurality of flow-through reaction tubes;

delivering at a predetermined rate a reaction gas having a uniform composition to each of the plurality of flow-through reaction tubes, where the reaction gas is operative to react with a catalyst disposed within each of the plurality of flow-through reaction tubes to form a reaction product; and

collecting the reaction product.

[c23] 23. The method of claim 22, where the predetermined temperature of each of the plurality of reaction tubes is substantially the same temperature.

[c24] 24. The method of claim 22, where the predetermined temperature of each of the plurality of reaction tubes is individually controlled.

[c25] 25. The method of claim 22, where the predetermined rate of delivery of reaction gas to each of the plurality of reaction tubes is substantially the same rate.

[c26] 26. The method of claim 22, where the predetermined rate of delivery of reaction gas to each of the plurality of reaction tubes is individually controlled.

[c27] 27. T he method of claim 22, further comprising simultaneously collecting reaction products from each of the plurality of reaction tubes.

[c28] 28.T he method of claim 22, further comprising selectively collecting reaction products from each of the plurality of reaction tubes.

[c29] 29.T he method of claim 22, further comprising cyclically collecting reaction products from each of the plurality of reaction tubes.

[c30] 30.T he method of claim 22, where the simultaneous reactions comprise a gas-condensed phase reaction.

[c31] 31.Th e method of claim 22, further comprising movably engaging each of the

plurality of reaction tubes such that the reaction gas is operatively sealable within each of the plurality of reaction tubes.

[c32] 32.Th e method of claim 22, further comprising movably engaging each of the plurality of reaction tubes such that the reaction gas is operatively sealable within each of the plurality of reaction tubes, where each of the plurality of reaction tubes comprises a variably biased seal.